6.0 OTHER REPORTABLE ACTIVITIES

Reported in this section are environmental surveillance activities other than those in air and water. Activities reported are those related to the Nevada Test Site (NTS) missions and special studies under the purview of the Environment, Safety and Health Division (ESHD) of the U.S. Department of Energy Nevada Operations Office (DOE/NV). Included herein are ecological monitoring, historic preservation, pollution prevention, Hazardous Materials Spill Center (HSC) operations, and waste management activities. Ecological monitoring encompasses habitat mapping, ecosystem monitoring, monitoring of special interest wildlife and plants, monitoring of natural and man-made water sources used by wildlife and related studies.

6.1 STOCKPILE STEWARDSHIP RELATED ACTIVITIES

Under the terms of an Interagency Agreement between the DOE and the U.S. Environmental Protection Agency (EPA), the EPA's Office of Radiation and Indoor Environments National Laboratory-Las Vegas (R&IE-LV) conducts the Offsite Radiation Safety Program (ORSP). The primary activity of the ORSP is routine monitoring of potential human exposure pathways. These pathways include groundwater (discussed in Chapter 5), and air and direct radiation exposure (discussed in Chapter 4). Maintaining readiness to support nuclear testing, public information, and community assistance constitute secondary activities.

Three subcritical experiments were conducted in 1999. For each of the experiments, R&IE-LV senior personnel served on the Test Controller's Scientific Advisory Panel and on the EPA's offsite radiological safety staff. No radioactive materials were released to the ambient environment as a result of these experiments.

6.2 NONRADIOLOGICAL MONITORING

The 1999 nonradiological monitoring program for the NTS included onsite sampling of various environmental media and substances for compliance with federal and state regulations or permits and for ecological studies. The Ecological Monitoring and Compliance (EMAC) program performed habitat mapping in northern NTS areas, characterized springs, monitored man-made water sources, conducted wild horse surveys, and prepared a biological monitoring plan for the HSC. In 1999, nonradiological monitoring was performed for six tests involving 21 chemicals that were at the HSC.

ENVIRONMENTAL SURVEILLANCE

Routine nonradiological monitoring on the NTS in 1999 was limited to:

- Nevada operating permit requirements.
- Sampling of electrical equipment oil, soil, water, surfaces, and waste oil for the presence of polychlorinated biphenyls (PCBs) as part of Toxic Substance Control Act compliance.
- Sampling of soil, water, sediment, waste oil, and other media for Resource Conservation and Recovery Act (RCRA) constituents.

Two facilities at the NTS that are listed in the NTS Hazardous Waste Management Permit have undergone RCRA Closure and require post-closure monitoring.

- Post-closure monitoring of the Mercury Landfill Hazardous Waste Trenches RCRA Closure Unit was conducted in 1999. The covers continue to perform as designed, with no releases occurring.

- Post Closure monitoring of the U-3fi Injection Well RCRA Closure Unit was conducted on a quarterly basis. Downward movement of moisture was not detected during the calendar year (CY); therefore, the conditions of the permit have not been exceeded.

ECOLOGICAL MONITORING

The ecological monitoring tasks conducted under the EMAC program in 1999 included habitat mapping, monitoring of special interest plants and wildlife, monitoring wetlands and wildlife water sources, and review of test plans for experiments conducted at the HSC to determine if biological monitoring was needed.

HABITAT MAPPING

In CY 1996, efforts began to map the wildlife and plant habitat of the NTS. Selected biotic and abiotic habitat features were collected within field mapping units called Ecological Landform Units (ELUs). ELUs are landforms with visually similar vegetation, soils, slope, and hydrology. Boundaries of the ELUs were defined using aerial photographs, satellite imagery, and field confirmation. ELUs are considered to be the most feasible mapping units by which sensitive plant and animal habitats on the NTS can be described. A total of 1,510 ELUs have been sampled on the NTS. Within each sampled ELU, habitat and vegetation data such as the surficial geology, relative abundance of shrub and tree species, and the percent ground cover by perennial plants were recorded. A habitat map showing the location of major woodland and shrubland alliances on the NTS was developed based on cluster analysis of the vegetation data from the 1,510 ELUs (Figure 6.1). ELUs were grouped into clusters based on the abundance of shrub/tree species within them. The analysis identified clusters, called vegetation associations, that were named according to the two or three most abundant shrub species found in a cluster. Each cluster of ELUs was then grouped into an alliance, defined by The Nature Conservancy (Grossman *et al.*, 1998; Anderson *et al.*, 1998), as a group of vegetation associations that have the same two to four dominant species. For the purposes of presentation, the vegetation alliances on the NTS were divided into groups, characteristic of either the Mojave Desert, the Great Basin Desert, or the Transitional Zone between these two deserts.

Analysis of selected biotic and abiotic data collected from ELUs was performed to identify groups of ELUs which may warrant active protection from DOE activities. Four groups of ELUs were identified:

- Pristine - ELUs with few man-made disturbances.
- Unique - ELUs containing uncommon biological resources such as a natural wetland.
- Sensitive - ELUs containing vegetation associations which recover very slowly from direct disturbance.
- Diverse - ELUs with high plant species diversity.

These groups are considered important NTS habitats (Figure 6.2). One ecosystem management goal is to minimize cumulative impacts on all plants and animals of the NTS. The long-term protection of these important habitats is considered one method by which overall cumulative impacts on biological resources can be minimized. During the siting review for new projects, it is recommended that these habitats be avoided, whenever possible.

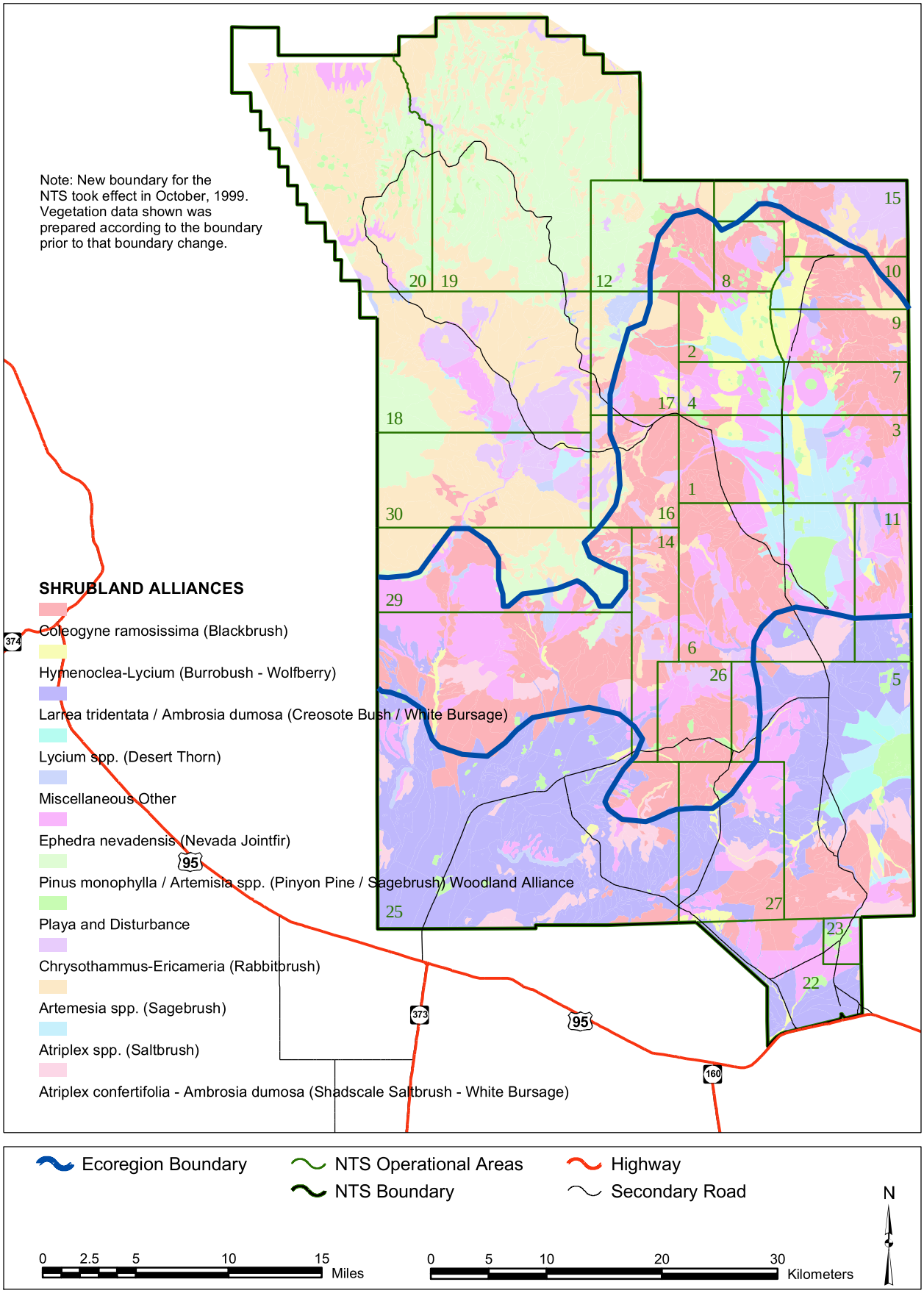


Figure 6.1 Habitat Map of Vegetation Alliances on the NTS

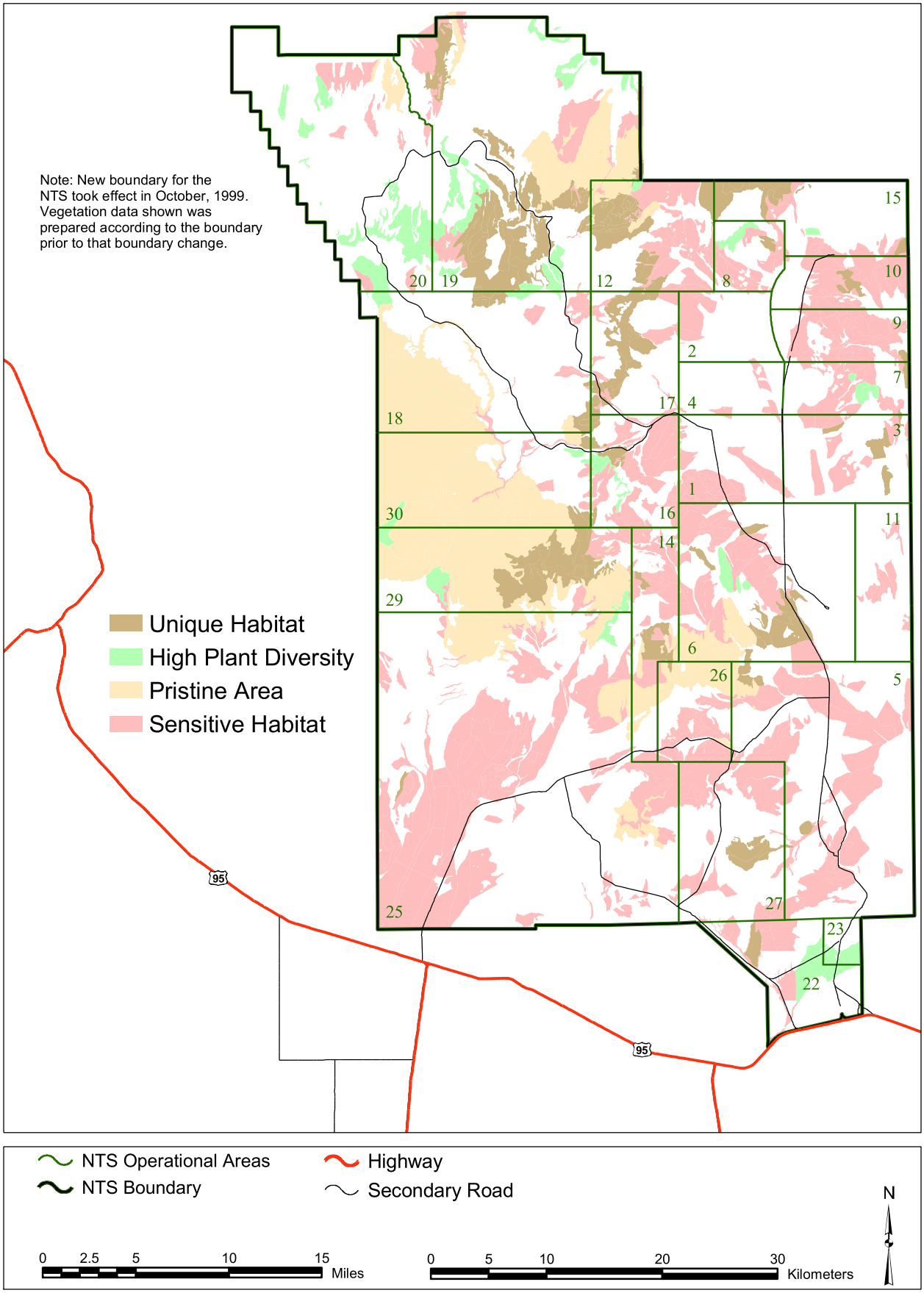


Figure 6.2 Important Habitats on the NTS

SENSITIVE SPECIES MONITORING

There are 26 species which occur on the NTS that are considered sensitive because they are either, (1) candidates for listing under the Endangered Species Act (ESA); (2) considered species of concern by the U.S. Fish and Wildlife Service (USFWS); (3) protected by other federal acts; or (4) state-managed species of public interest. The goal of sensitive species monitoring is to ensure their continued presence on the NTS by protecting them from significant impacts due to DOE/NV actions. A secondary goal is to gather sufficient information on these species' distribution and abundance on the NTS to determine if further protection under state or federal law is necessary.

SENSITIVE PLANTS

Clokey's eggvetch (*Astragalus oophorus* var. *clokeyanus*) is currently the only candidate plant known to occur on the NTS. Field surveys to collect baseline data for this plant were initiated in 1996 and completed in 1998 (Anderson 1998). The field surveys contributed significantly to the overall understanding of this species' distribution and need for protection. Its distribution extends from the Spring Mountains, just west of Las Vegas, Nevada, north to Cedar Pass in the Kawich Range, approximately 70 miles southeast of Tonopah, Nevada. Anderson (1998) concluded that, due to its localized distribution within Nevada, Clokey's eggvetch should be considered a species of concern, but it does not warrant the status of candidate species for listing under the ESA. This recommendation was approved by the USFWS.

Surveys for twelve plant species of concern were completed in 1995 (Blomquist *et al.*, 1995). No new field surveys for sensitive plants were conducted in 1999. Sufficient baseline data has been collected to initiate long-term monitoring of all sensitive plants.

WESTERN BURROWING OWL

The western burrowing owl (*Speotyto cunicularia*) is a species of concern which breeds on the NTS. It is found throughout the central and western United States and Canada in flat, open, well-drained grasslands, steppes, deserts, prairies, and agricultural lands (Haug *et al.*, 1993). These owls usually occupy the burrows made by other animals, and population declines over their range have been related to habitat destruction, pesticides, and predators. On the NTS, the burrowing owl occurs in all three ecoregions: the Great Basin Desert, Transition Zone, and the Mojave Desert (Figure 6.3). They occupy the burrows of predators (e.g., coyote, kit fox, badger) and desert tortoises, as well as man-made structures such as buried pipes.

The objective of burrowing owl monitoring is to collect baseline information on the distribution and relative abundance of these owls on the NTS. This information will allow DOE/NV to minimize impacts of its activities on the species and be prepared for consultation with the USFWS if the species were ever listed under ESA. Collection of baseline data continued in 1999.

Twenty-eight burrows were found this year during searches for new burrows, bringing the total number of known burrows to 64 (Figure 6.3). For monthly monitoring of known burrows, 19 burrows were monitored in the Mojave Desert ecoregion, 35 in the Transition Zone, and 7 in the Great Basin Desert. This is the second year of monitoring which has confirmed that some burrowing owls reside year round on the NTS, although most migrate seasonally.

Seven different breeding pairs of owls were detected. A total of 14 juvenile owls were observed at 4 burrows in the Transition Zone (3 to 5 young per burrow) and 10 juveniles were observed at three burrows in the Great

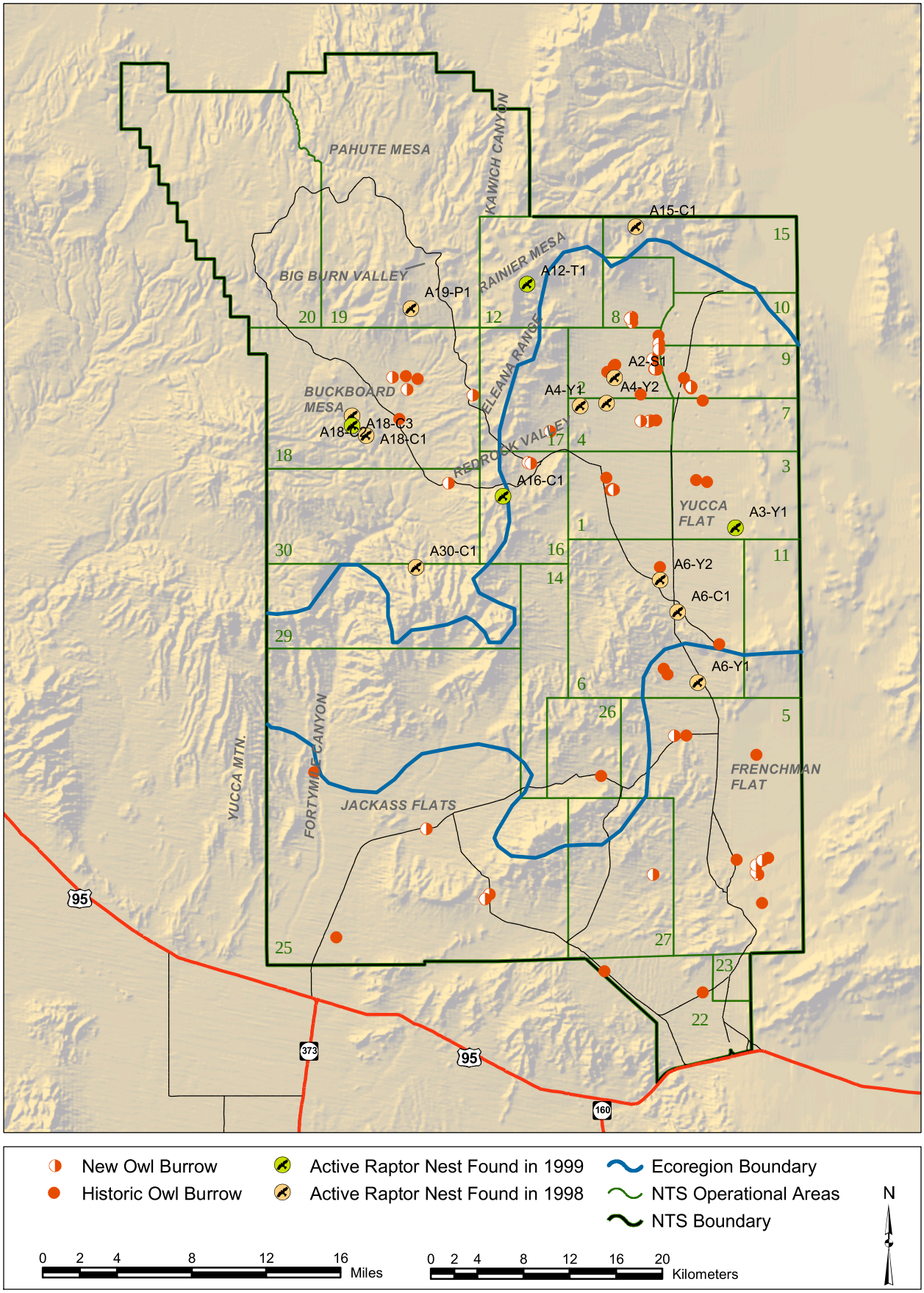


Figure 6.3 Location of Known Owl Burrows and Raptor Nests on the NTS - 1999

Basin Desert (one to six young per burrow). No breeding pairs or young owls were detected in the Mojave Desert ecoregion.

The 1999 monitoring data suggest that prey may have been more abundant and owl habitat better in the Transition Zone and Great Basin Desert portions of the NTS than in the Mojave Desert portion. Also, nearly two-thirds of the known burrows monitored this year were man-made, consisting of partially- or fully- buried pipes and open-ended culverts. This suggest that some human activities on the NTS have benefitted this species by providing suitable burrows.

BAT SPECIES OF CONCERN

Minimal work has been done in the past to document bat communities on the NTS. Jorgensen and Hayward (1965) opportunistically collected four bat species on the NTS, although O'Farrell and Emery (1976) concluded that there were several additional species having geographic ranges which overlap the NTS. During the 1990s, surveys brought the number of bat species on the NTS to 13 (EG&G/EM 1993; Saethre 1994; Steen *et al.*, 1997; BN 1998). In 1999, yet another species (the big free-tailed bat [*Nyctinomps macrotis]*) was detected on the NTS via vocalization surveys. Of the 14 bat species now documented on the NTS, 7 are species of concern. They are the Townsend's big-eared bat (*Corynorhinus townsendii*), spotted bat (*Euderma maculatum*), small-footed myotis (*Myotis ciliolabrum*), long-eared myotis (*Myotis evotis*), fringed myotis (*Myotis thysanodes*), the long-legged myotis (*Myotis volans*), and the big free-tailed bat.

Mist-net capture and recorded-vocalization surveys for bats were continued this year to estimate the distribution of these species and their roost sites. These data are used to evaluate and mitigate impacts of DOE/NV activities on these bats and will be used as baseline date for monitoring trends in the distribution and abundance of the bats.

In 1999, 46 bats representing 5 species of concern, were captured in mist-nets at water sources in the Great Basin Desert eco-region. No bat species of concern were captured in the other two eco-regions of the NTS (Mojave Desert, Transition Zone) this year.

Mist-net trapping data suggest that the best bat habitat on the NTS is found in the Great Basin Desert ecoregion. This is probably due to the fact that bats use mines, caves, crevices, trees, and/or cliffs as roost sites (Brown and Pierson, 1996), and these features are found in greater abundance in the Great Basin Desert ecoregion than in the other ecoregions of the NTS.

WILD HORSES

Wild horses (*Equus caballus*) occur on the NTS, and ongoing monitoring of this species was conducted in fiscal year (FY) 1999. Wild horses are protected on public lands under the Wild Free-Roaming Horse and Burro Act of 1971. This act calls for the management and protection of wild horses and burros in a manner that is designed to achieve and maintain a thriving natural ecological balance. Although the NTS is on land withdrawn from public use, DOE/NV is committed to this same management goal on the NTS. In 1997, DOE/NV signed a Five-Party Cooperative Agreement with Nellis Air Force Range (NAFR), USFWS, U.S. Bureau of Land Management (BLM), and the state of Nevada Clearinghouse. The goal of the agreement is to enhance management of the natural resources within ecosystems on the NAFR, the NTS, and the Desert National Wildlife Range. This agreement facilitates an ecosystem-based approach in the management of free-roaming animals with large home ranges, such as wild horses. BN conducts an annual horse census on the NTS. The NTS horse population has not increased in size over time as on the NAFR, and it appears to be isolated from the NAFR population. In the past five years, a decline in horse numbers on the NTS has been observed.

In FY 1999, BN biologists performed three tasks related to horse monitoring:

- Annual horse abundance was estimated to monitor population stability.
- Horse signs were recorded along selected roads to better define the geographic range of horses on the NTS.
- Selected natural and man-made water sources were visited in the summer to determine their influence on horse distribution and movements and to determine the impact horses are having on NTS wetlands.

Since 1995, the feral horse population has declined 43 percent, from 54 to 31 horses (these counts exclude foals) (Table 6.1). Of the 23 horses which have been classified as missing since 1995, 11 were males, 10 were females, and 2 were yearlings of unknown sex. No foals observed in 1995 through 1998 survived to yearlings. Natural processes (e.g., predation, emigration) may be likely causes of the observed population decline. Although some indirect evidence of predation on foals and adults has been observed (e.g., partially eaten carcasses), direct evidence is lacking.

The annual population census of horses has routinely been conducted in the summer when horses are nearer to water sources and thus easier to find. These census surveys provide an adequate estimate of the summer range of horses on the NTS but are not useful for estimating their annual range. In 1999, selected roads were driven within and along the boundaries of the suspected annual horse range and all fresh sign (estimated to be < 1 year old) located on and adjacent to the roads were recorded. Horse sign data collected during the road surveys and horse use at natural and man-made water sources indicate that the 1999 NTS horse range includes Kawich Canyon, Gold Meadows, northwest Yucca Flat, southwest foothills of the Eleana Range, and southeast Pahute Mesa (Figure 6.4).

The annual horse range appears not to have changed in areal extent or shape from the previous year.

Two newly found wetlands in Area 30, Wild Horse and Little Wild Horse seeps, are located within the annual horse range on the NTS and were used by horses in spring and summer. Only two other natural water sources (Captain Jack and Gold Meadows Springs in Area 12) and one man-made pond (Camp 17 Pond in Area 18) were used by horses this summer, as in past years.

RAPTORS

There are eight raptors (Table 6.2) which are known to breed on the NTS (Greger and Romney, 1994); however, only a few records exist, of breeding raptors on the NTS or of their reproductive success, egg incubation periods, and fledging times (time when young leave the nest). Surveys to locate raptor nests and the number of breeding pairs of raptors began on the NTS in 1998 and were continued in 1999.

From April through July 1999, the following regions were surveyed: Yucca Flat, Oak Spring Butte, Buckboard Mesa, Rainier Mesa, lower Stockade Wash, Shoshone Mountain, and the Tippipah Spring area. These regions included three new areas which had not been previously searched: (1) a Joshua tree habitat in southeast Yucca Flat, (2) a cliff site west of Tippipah Spring, and (3) a cliff site in Stockade Wash. Ten of the twelve active nest sites found in 1998 were surveyed again in 1999.

When nests were found, efforts were made to determine the number of young in the nest without disturbing the birds. Nests containing young were periodically revisited to determine the status of nestlings.

Four new raptor nests were detected during ground searches (Figure 6.3). Five active nests were detected this year (two golden eagle cliff nests, one red-tailed hawk cliff nest, one red-tailed hawk Joshua tree nest,

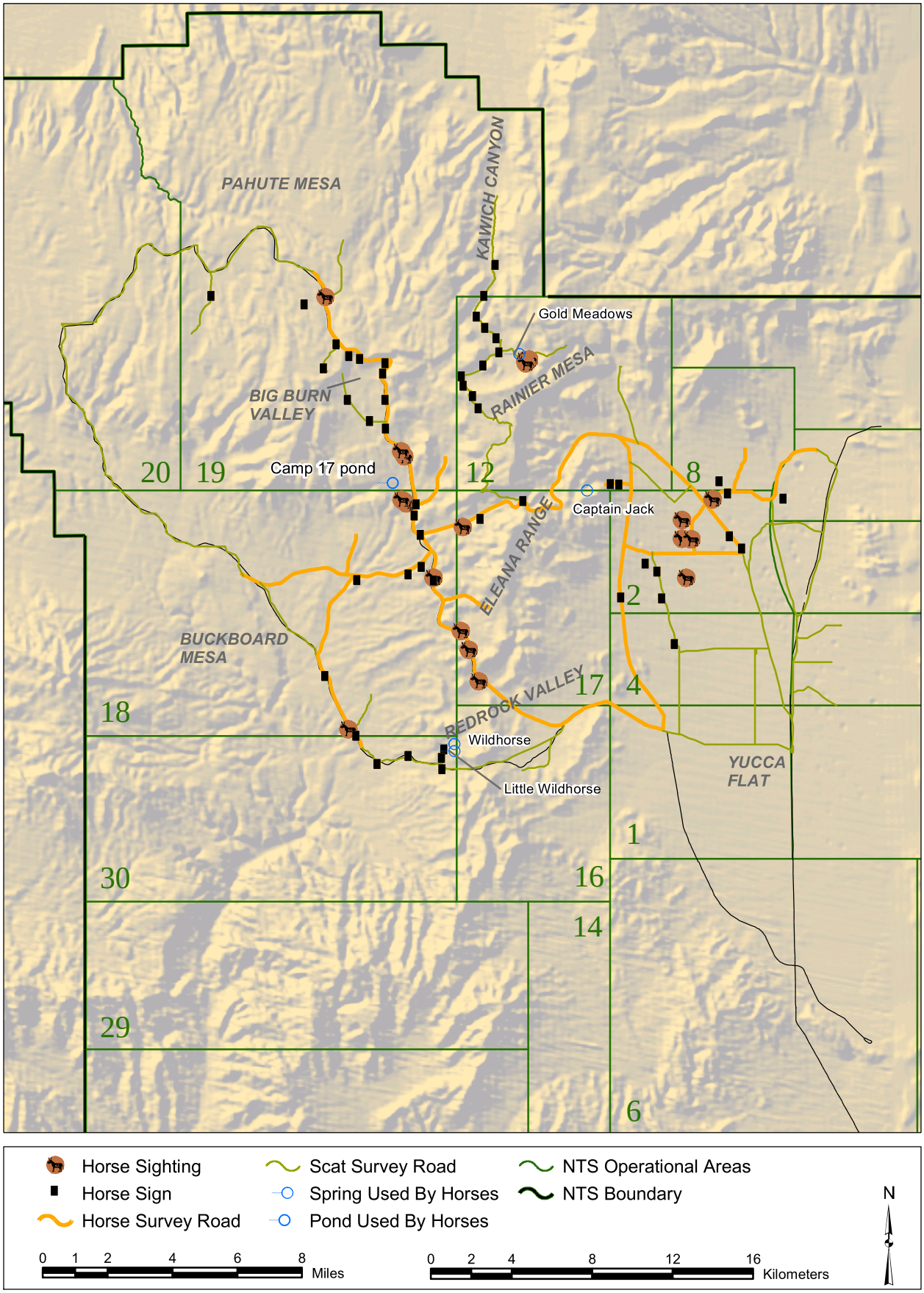


Figure 6.4 Feral Horse Sightings and Horse Sign Observed on the NTS - 1999

and one red-tailed hawk microwave tower nest). Twelve active raptor nests were observed last year. None of four Joshua tree nests and one of five cliff nests active in 1998 were reused this year.

Three of the five active nests found this year contained young birds. Among them were three eaglets and two red-tailed hawk nestlings.

The number of active nests is an index of the number of breeding pairs on the NTS. The low number of breeding pairs (i.e., active nests) observed this year may be due to a reduced prey base of mourning doves. Lower numbers of doves on the NTS (and other prey species like small mammals and insects) may be the result of a relatively dry fall in 1998 and a dry winter and spring in 1999.

These survey data continue to support the recommendation to avoid, whenever possible, the removal of Joshua trees within proposed project areas because they are known to provide an important structural component to the ecosystem. Also, elevated cliff-nesting sites for species such as golden eagles and red-tailed hawks should be left unaltered whenever possible because they may be used repeatedly year after year.

MONITORING NATURAL WATER SOURCES

Natural wetlands and man-made water sources on the NTS provide unique habitats for mesic and aquatic plants and animals and attract a variety of other wildlife. Natural NTS wetlands may qualify as jurisdictional wetlands under the Clean Water Act (CWA). Characterization of these mesic habitats to determine their status under the CWA and periodic monitoring of their hydrologic and biotic parameters are components of the Ecological Monitoring program which was started in 1997. Periodic wetlands monitoring may help identify annual fluctuations in measured parameters that are natural and unrelated to DOE/NV activities. Also, if a spring classified as a jurisdictional wetland were to be unavoidably impacted by a DOE/NV project, mitigation for the loss of wetland habitat would be required under the CWA. Under these circumstances, wetland hydrology, habitat quality, and wildlife usage data collected at the impacted spring over several previous years can help to develop a viable mitigation plan and demonstrate successful wetland mitigation.

In 1998, BN biologists described five new wetland sites on the NTS (four new seeps and one man-enhanced pond) (BN 1998). They are Wildhorse, Little Wildhorse, Rattlesnake seeps, Wahmonie Seep #4, and Pahute Mesa Pond (Figure 6.5). These five sites were visited in May 1999 to determine if they have the following three field indicators which meet the criteria of jurisdictional wetlands: hydrophytic vegetation, wetland hydrology, and hydric soils. These field indicators have been measured and reported for the other 25 natural water sources of the NTS (Hansen *et al.*, 1997). During the May survey, Wildhorse Seep, Little Wildhorse Seep, and Wahmonie Seep #4 possessed all three field indicators. Rattlesnake Seep and Pahute Mesa Pond lacked dominance of hydrophytic vegetation. These five water sources will continue to be monitored for the next two years to determine variations in site vegetation and hydrology. Once the hydrology and vegetation have been fully characterized, a supplement to the previous wetlands report (Hansen et al., 1997) will be prepared.

Monitoring of selected NTS wetlands was continued this year to characterize seasonal trends in physical and biological parameters. A total of 18 wetlands was visited at least once to record the presence/absence of land disturbance, water flow rates, and surface area of standing water (Table 6.3).

The wildlife observed during visits to these water sources was also recorded. Four species of mammals and 16 species of birds were detected at 14 water sources. The most widely distributed species was the coyote, observed at 9 of the 14 sites. Horses, mule deer, and mountain lion were the other mammals observed. Chukar and Gambel's quail were each observed at four different sites and were the most abundant

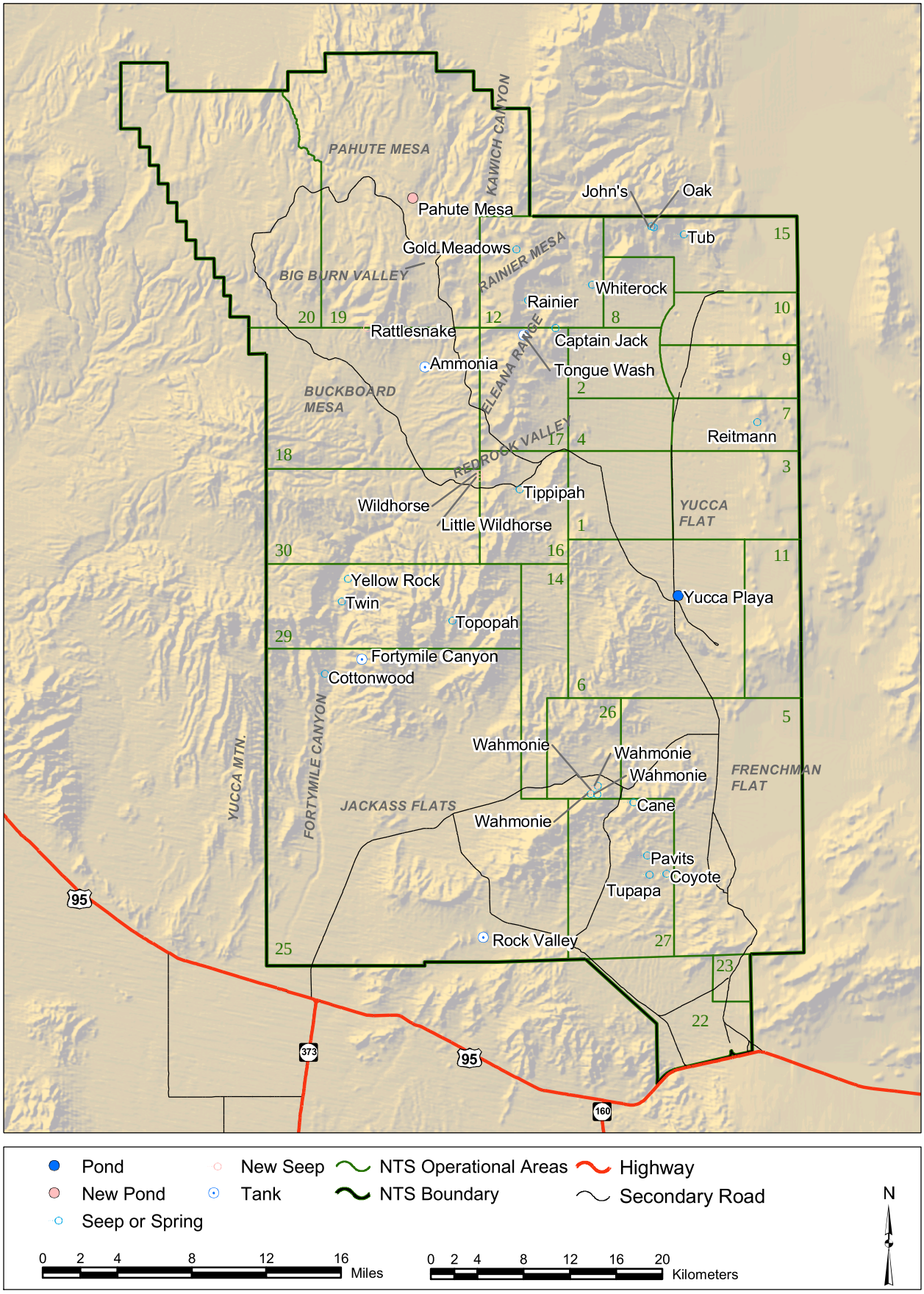


Figure 6.5 Natural Water Sources on the NTS

bird species observed. Mourning doves were not observed at any of the water sources, whereas in 1998, they were the most numerous and widely distributed birds observed during the summer.

MONITORING MAN-MADE WATER SOURCES

Man-made excavations constructed to contain water occur throughout the NTS. Like natural water sources, they too can affect the movement patterns of some species (e.g., wild horses). However, they can also cause accidental wildlife mortalities from entrapment and drowning if not properly constructed or maintained. Quarterly monitoring of man-made water sources was conducted in 1999. These sources, located throughout the NTS, included 35 plastic-lined sumps, 39 sewage treatment ponds, 13 unlined well ponds, and 4 radioactive containment ponds. Several ponds or sumps are located next to each other at the same project site. They are monitored to assess their use by wildlife and to develop and implement mitigation measures to make them safer for use by wildlife. Mitigation measures, required under the Mitigation Action Plan for the Final Environmental Impact Statement (DOE 1996c), include placing flag lines over contaminated water sources to repel birds, or fencing or covering them. Quarterly monitoring ensures that all flag lines, fencing, or covers are checked for their integrity and repaired when needed.

Man-made water sources were visited during four quarterly sampling periods; November, February, May and August 1999. Use of unlined sumps and ponds by migratory birds and mammals such as coyotes and deer was common. The fences installed around the plastic-lined sumps do not exclude coyotes or deer, as their tracks were observed commonly inside many of the fences. Birds were observed much less at the plastic-lined sumps compared to the unlined ponds.

Four coyotes have drowned in sump #3, a plastic-lined sump at ER-20-6 in Area 20. One deer was also found dead in sump #4, also located at ER-20-6, during February 1999. Sump #3 is particularly dangerous to animals because it is commonly nearly full and there are no ramps extending above the waterline which can be used by trapped animals. Recommendations to install a sediment ramp in one corner of this sump and lowering the water level 4-5 ft in depth were made in quarterly reports.

HAZARDOUS MATERIALS SPILL CENTER MONITORING

Biological monitoring at HSC is required for certain types of chemicals under the Center's Environmental Assessment. These chemicals have either not been tested before, have not been tested in large quantities, or have uncertain modeling predictions of downwind air concentrations. In addition, DOE ESHD has requested that BN monitor (downwind) any test which may impact plants or animals outside the experimental area.

A document entitled "Biological Monitoring Plan for Hazardous Materials Testing at the Liquefied Gaseous Fuels Spill Test Facility on the Nevada Test Site" (BN 1996) has been prepared that describes the conduct of field surveys used to determine test impacts on plants and animals and verify that the spill program complies with pertinent state and federal environmental protection legislation. The monitoring plan calls for the establishment of three control transects and three treatment transects, which have similar environmental and vegetational characteristics, at three distances from the chemical release point. BN biologists review spill test plans to determine if field monitoring along the treatment transects is required as per the monitoring plan criteria.

Biota monitoring was not conducted for any of the chemical tests at the HSC during 1999. No baseline monitoring was conducted at established control-treatment transects near the HSC due to insufficient funding.

HISTORIC PRESERVATION

Historic preservation studies and surveys are conducted by the Desert Research Institute (DRI), University and Community College System of Nevada. In 1999, six cultural resources surveys, one inventory project, and one historical evaluation were conducted at the NTS. The six cultural resources surveys were undertaken in support of proposed projects with 2,928 acres examined by historic preservation personnel. Seven archaeological sites were located and recorded during these surveys. Only one of the sites, Camp Desert Rock, was determined eligible to the National Register of Historic Places (NRHP) through consultation between the DOE/NV and the Nevada State Historic Preservation Office (NSHPO). The other six sites did not meet the criteria for NRHP eligibility. The one inventory project entailed the recording of atmospheric nuclear testing remains in and near Frenchman Lake in Area 5. This project identified 155 structures and associated features. The technical report detailing the results is in progress and is expected to result in the creation of a Frenchman Flat Historic District. A historical evaluation of the Nuclear Rocket Development Station Train Engine housed in the EMAD facility in Area 25 was undertaken in response to a proposal to move the train engine from its present location to the train museum in Boulder City. The historical evaluation demonstrated the significance of the train engine for its association with important events in our history. Through consultation between DOE/NV and the NSHPO, the engine was determined eligible to the NRHP and DOE/NV received concurrence from the NSHPO to relocate it.

The technical report that describes the results of an archaeological data recovery program for the proposed Kistler Rocket Launch Facility in the northern part of the NTS was finalized and accepted for inclusion in Nevada's Cultural Resources archives. This mitigative action was conducted because a proposed project could not be relocated and impacts to the site were considered unavoidable. Also completed this year was the draft technical report on the Fortymile Canyon petroglyphs. The archaeological research documented more than 2,900 images on approximately 700 boulders at a number of sites in the area. The final report will be issued in 2000.

In addition to the aforementioned documents, the Secretary of the Interior's Report to Congress on Federal Archaeological Activities Questionnaire for FY 1998 was completed for DOE/NV activities. The Cultural Resources Management Plan for the NTS was finalized and distributed to interested parties. Besides reviewing compliance requirements and DOE/NV procedures related to cultural resources, the plan also identifies the historic preservation projects that need to be conducted in the near future. Following DOE/NV's commitments relating to the Resource Management Plan (RMP), the historic preservation section for the 1999 annual update to the RMP was completed. Additionally, the databases outlined in the RMP were maintained and updated.

The program to monitor the historic properties on the NTS was initiated in 1999 with a database study to determine the number of sites to be monitored in 2000 and to compile all information regarding these sites. The purpose of this program is to determine if any of the sites are being adversely affected by natural and human activities.

To comply with federal regulations in Title 36 CFR 79 (CFR 1966), DRI continues to curate the more than 500,000 artifacts in the DOE/NV collection. DRI produced an annual report summarizing curation compliance activities.

One report was prepared on consultations conducted with Native American tribes and organization. The report summarized the recommendations of the Consolidated Group of Tribal Organizations in regard to the

repatriation of selected artifacts from recently accessioned collections from the NTS.

Other efforts on the NTS in 1999 included preparing management objective and plans and promoting public relations and communications concerning the NTS historic preservation program.

6.3 Pollution Prevention and Waste Minimization Program

When economically feasible, source reduction is the preferred method of handling waste, followed by reuse and recycling, treatment, and, as a last resort, land disposal. DOE/NV's systematic approach to source reduction is achieved by performing pollution prevention opportunity assessments (PPOAs). The objective of a PPOA is to identify methods to reduce energy consumption and/or eliminate waste streams via a planned and documented procedural process. Subsequently, the technical and economical feasibility of options are evaluated, and the most feasible option is selected for implementation. Options include product substitution, process change (i.e., use of alternate equipment or procedure), and onsite and offsite recycling. When selecting which PPOA to perform, the goal is to reduce or eliminate the volume and/or toxicity of waste.

Another effective method for source reduction is the coordination of the material exchange program within DOE/NV and between DOE/NV and other governing agencies (e.g., Nevada Department of Environmental Protection). Unwanted chemicals, supplies, and equipment are posted on the intranet material exchange list so that individuals in need can obtain the items at no cost. These materials are destined for disposal, either as solid or hazardous waste, as a result of process modification, discontinued use, or shelf life expiration. Rather than disposing of these items, the majority of them are provided to other employees for their intended purpose, thus avoiding disposal costs and costs for new purchases. If items are not placed with another user, they can be returned to the vendor to be recycled or reused.

EMPLOYEE AND PUBLIC AWARENESS

As stated in DOE Order 5400.1, chapter III-4c, DOE/NV's P2 program must include the implementation of an employee awareness program. Employee awareness of P2 issues throughout DOE/NV is accomplished by dissemination of articles through both electronic mail and DOE/NV newsletters, the development and maintenance of a P2 intranet website, employee training courses, and participation at employee and community events. These activities are intended to increase awareness of P2 and environmental issues and their role in improving environmental conditions in the workplace and community.

POLLUTION PREVENTION ACTIVITIES

DOE/NV demonstrated efforts to deactivate reactive waste, specifically the treatment of waste explosives at the NTS Area 11 Explosive Ordnance Disposal Unit (EODU). Approximately 2.27 kilograms (kg) (5 pounds [lb]) of reactive hazardous waste (waste explosives) were treated at the EODU during CY 1999. In addition, approximately 116 kg (250 lb) of commercially manufactured explosive devices destined for disposal were evaluated and determined to be useful products, thereby eliminating the need for treatment and disposal.

One PPOA was performed during CY 1999 that involved an evaluation of the disposal of dry cell Nickel Cadmium (Ni-Cd) batteries. The current practice included managing dry cell Ni-Cd batteries as universal waste and shipping them offsite for disposal. The conclusion of the assessment was to continue managing the dry cell Ni-Cd batteries as universal waste and ship them offsite to a recycling facility. While researching information for the assessment, we discovered the Rechargeable Battery

Recycling Corporation (RBRC), a nonprofit public service organization, whose mission is to be the international leader in the environmentally safe collection, transportation, and recycling of rechargeable batteries. This organization is funded by various battery manufacturers and provides prepaid shipping containers at a minimal cost. By shipping Ni-Cd batteries to an approved recycling facility through the RBRC program, waste generators can realize a significant cost savings. This PPOA is in the process of being implemented.

Through the material exchange program, approximately 2.67 metric tons (mTon) of materials and equipment, at a cost savings of about $62,000, were exchanged. These materials included both hazardous and non-hazardous materials.

The following activities enhanced employee awareness of P2 practices:

- Bring Your Kids to Work Day: Workshop was conducted on recycling and pollution prevention practices for employees and their children.

- Earth Day: The week-long event included an exhibit of office products containing post consumed recycled materials in accordance with Affirmative Procurement; handouts of literature on helpful P2 hints; articles published in the Sitelines publicatoin; P2 messages through electronic mail; and distribution of promotional items made from recycled materials as daily reminders regarding the benefits of recycling.

- Holiday and all-occasion card collection: St. Jude's Ranch recycles these cards into new "born again" cards.

- National P2 Week: The week-long event included an exhibit of P2 success stories; office products containing post consumed recycled materials in accordance with Affirmative Procurement; and viewing of the P2 home page.

- Integrated Safety Management Day: The event included an exhibit of P2 success stories; literature containing pollution prevention holiday tips; literature about composting; and distribution of promotional items made from recycled materials as daily reminders regarding the benefits of recycling**.**

- Publication of various P2 articles: Another means of employee communication includes dissemination of articles through both electronic mail and DOE/NV newsletters with the intent of increasing employee awareness of environmental issues and their role in improving environmental conditions in the workplace and community.

- P2 Website: An intranet P2 website has been on-line since April 1998. Information found on the website includes, but is not limited to: points of contact, management commitment, P2 Program Plan, P2 success stories, employee suggestions, material exchange program, list of people interested in car pooling, and current P2 activities.

- Offsite visits: The P2 Project Office traveled to its' offsite location at Los Alamos, New Mexico to promote pollution prevention, waste minimization, and recycling awareness. In addition, pollution prevention reporting requirements for the site were established.

- Training: Management and employees are instructed in P2 and waste minimization policies and practices during classroom training courses (e.g., Hazardous Waste Site General Worker Operator and Emergency Response, Waste Management for the Generator, Rad Worker II, and General Employee Orientation).

VOLUME AND TOXICITY REDUCTION

Table 6.4 is an overview of the estimated RCRA hazardous waste and toxicity reduction through implementation of P2,

waste minimization, and recycling activities during CY 1999. The waste reduction activities eliminated an estimated 107 metric tons (mton) of RCRA hazardous waste.

RECYCLING ACTIVITIES FOR CALENDAR YEAR 1999

Through recycling, hazardous and solid waste disposal can be significantly reduced or eliminated, reducing costs associated with disposal, shipping, and labor. Table 6.5 lists the recycling activities that occurred at all DOE/NV.

6.4 HAZARDOUS MATERIALS SPILL CENTER (HSC)

The HSC was established in the Frenchman Basin in Area 5 as a basic research tool for studying the dynamics of accidental releases of various hazardous materials and the effectiveness of mitigation procedures. The HSC was designed and equipped to, (1) discharge a measured volume of a hazardous fluid at a controlled rate on a specially prepared surface; (2) monitor and record downwind gaseous concentrations, operating data, and close-in/downwind meteorological data; and (3) provide a means to control and monitor these functions from a remote location.

The HSC operates under Permit 13990037X and has the capability of releasing large volumes of cryogenic and non-cryogenic liquids at rapid rates through a 152 m (500-ft) spill line to the experimental area supporting the tank farm. Spill rates for the cryogenic system range from 1,000 to 26,000 gallons per minute (gpm) with the capability to release the entire contents of both tanks in two minutes. The non-cryogenic system can release fluids at rates of 500 to 5,000 gpm (1.9 to 19 m^3/min), with the capability of releasing the entire 90.8 m^3 (24,000 gallons) in five minutes.

Test sponsors can vary intake air temperature, humidity, release rate, and release volume in a 2.4 x 4.8 x 25.3 m (8 x 16 x 96 ft) wind tunnel. There are two spill pads available for use in contained open air releases of volumes of 0.19 to 3.8 m^3 (50 to 1,000 gallons). Test Area 4 has been added primarily to provide the testing capability for determining the efficacy of totally encapsulated chemical protective suiting materials when exposed to high concentrations of toxic and hazardous gaseous materials. In addition, Test Area 4 has two stacks used for controlled low concentration releases for chemical sensor test and evaluation.

DOE/NV provides the facilities, security, and technical support, but all costs are borne by the organization conducting the tests. The plans for each test series were examined by an Advisory Panel that consisted of DOE/NV and EPA's R&IE-LV professional personnel augmented by personnel from the organization performing the tests.

For each test, the R&IE-LV provides an advisor on offsite public health and safety for the Operations Controller's Test Safety Review Panel. At the beginning of each test series and, at other tests depending on projected need, a field monitoring technician from the EPA with appropriate air sampling equipment is deployed downwind of the test at the NTS boundary to measure chemical concentrations that may have reached the offsite area. Samples are collected with a hand-operated Dräger pump and sampling tube appropriate for the chemical being tested. Not all tests are monitored by R&IE-LV, if professional judgement indicates that, based on previous experience with the chemical and the proposed test parameters, NTS boundary monitoring is unnecessary. The EPA monitors at the NTS boundary, in contact by two-way radio, are always placed at the projected cloud center line.

During 1999, there were eight projects conducted at the HSC: (1) Effluent Tracking Experiment - ORCA Episode using ten materials released from a stack in February and March; (2) the Chemical Agent Dual Detector Integration Experiment I (CADDIE I) using four stimulants released from a stack for airborne detection in March; (3) the Osprey I experiments testing ground

based sensors with four materials released from a stack at very low concentrations in May; (4) the CADDIE II episode using four stimulants conducted in May; (5) Remote Sensor Test Range-Nighthawk I Episode using 20 materials in August and September; (6) the Frostproof stream environmental fate study for a simulated biological agent in October at the Cambric Ditch; (7) the Osprey II experiments testing ground based and airborne sensors with four materials released from a stack at very low concentrations in October; (8) Remote Sensor Test Range-Nighthawk II Episode using four materials in December. All of the tests supported involved low chemical release quantities. No offsite monitoring was performed by R&IE-LV personnel in 1999.

6.5 WASTE MANAGEMENT ACTIVITIES

RADIOACTIVE WASTE

Low-level radioactive waste (LLW) from the DOE-approved generators is disposed of at two locations on the NTS. Packaged LLW is disposed of at the Area 5 Radioactive Waste Management Site (RWMS-5) in shallow pits and trenches. LLW in large containers and unpackaged bulk waste from environmental restoration projects are buried in selected subsidence craters at the Area 3 RWMS (RWMS-3). Hazardous, transuranic (TRU), and mixed TRU wastes are stored aboveground pending shipment to offsite permitted disposal facilities.

RWMS-5 WASTE MANAGEMENT OPERATIONS

The RWMS-5 is used for the disposal of radioactive waste generated at the NTS and at offsite DOE and U.S. Department of Defense facilities. LLW is accepted for disposal from generators that have received approval from DOE Headquarters and DOE/NV (NTS 1996). Disposal of mixed waste is still restricted to waste generated by DOE/NV.

LLW, mixed waste, and small quantities of TRU waste have been disposed of in 22 shallow pits and trenches since disposal operations began in 1960. The shallow pits and trenches range in depth from 4.6 to 14.6 m (15 to 48 ft). Filled pits and trenches are covered by a 2.4 m (8 ft) alluvium cap pending final closure of the site.

LLW disposed of prior to implementation of RCRA (CFR 1984) by DOE in 1986 may contain low levels of hazardous constituents. A single disposal unit, Pit 3, has interim status as a mixed waste disposal unit for NTS generated wastes that meet the RCRA Land Disposal Restrictions (LDR) requirements. Low-level mixed waste generated on the NTS is stored on the TRU waste storage pad until characterization is complete. If the waste meets or has been treated to meet LDR requirements, it may be disposed of in Pit 3.

TRU mixed waste is stored in a covered building on a specially constructed RCRA-designed pad. In 1998, the Waste Examination Facility (WEF) began operations to certify this stored TRU mixed waste for disposal at the Waste Isolation Pilot Plant in New Mexico. Low-level radioactive mixed waste is also currently stored on the TRU waste storage pad.

In 1999, the RWMS-5 received 9.00×10^3 m^3 (3.18×10^5 ft^3) of waste containing a total of 1.5×10^6 Ci (5.6×10^4 TBq) of reportable radionuclides. This represents an increase in volume and activity from the previous year because of more shipments from Fernald (see Table 6.6). The trend in bulk disposal at each RWMS is shown in Figures 6.6 and 6.7. Tritium accounted for more than 99.9 percent of the total radioactivity disposed of in 1999 (see Table 6.7). Uranium-238, ^{234}U, and ^{238}Pu were the next most important radionuclides in the 1999 inventory.

Monitoring activities at the RWMS-5 in 1999 included measurement of radioactivity in air and groundwater, measurement of gamma and neutron radiation fields, and soil moisture monitoring. Air samples were

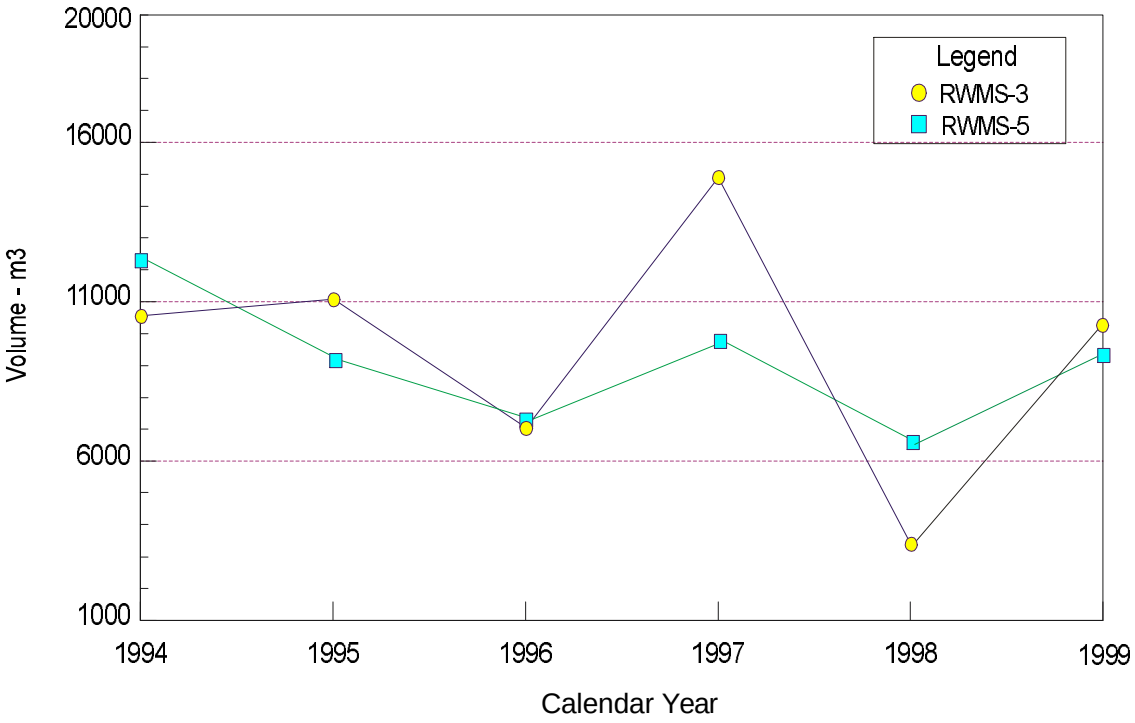


Figure 6.6 Total Volume of Waste Disposed of at RWMS-3 and RWMS-5

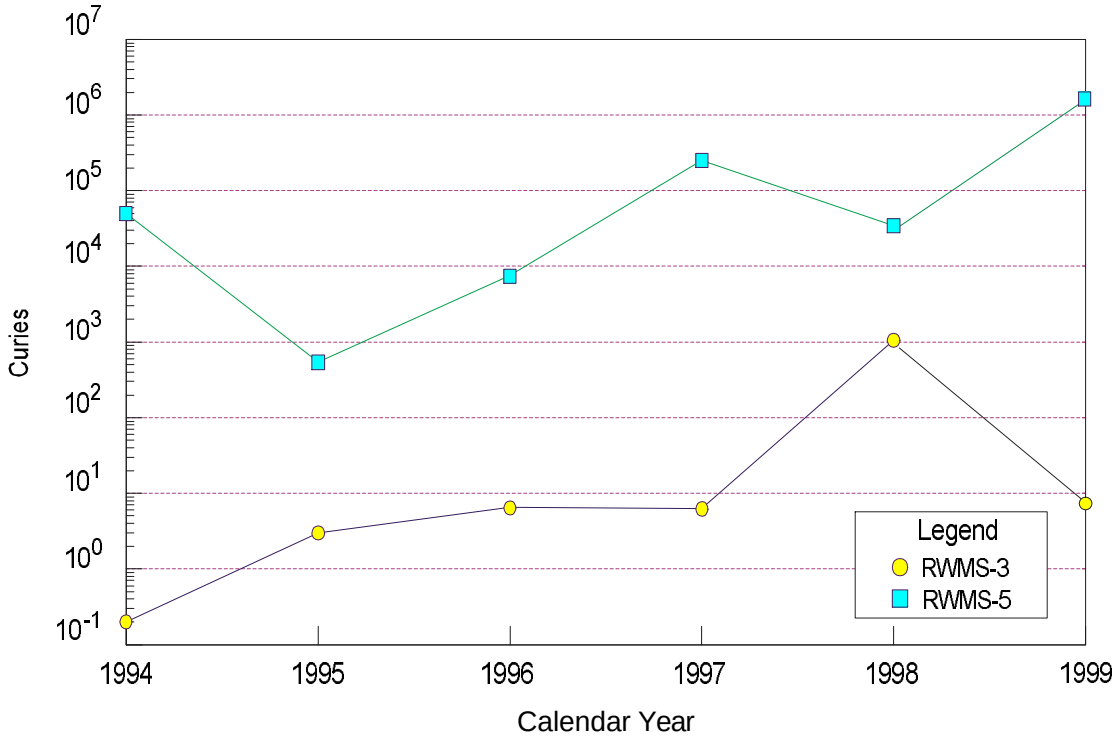


Figure 6.7 Total Curies Disposed of at RWMS-3 and RWMS-5

analyzed for gross alpha and gross beta radiation, photon-emitting radionuclides, plutonium, and tritium. Tritium and $^{239+240}$Pu were the only man-made airborne radionuclides detected at the RWMS-5. All airborne radionuclide concentrations were a small fraction of DOE allowable limits. Airborne tritium at the RWMS-5 probably originates from disposed LLW. The highest annual average tritium concentration determined from samples collected in 1999, 4.3×10^{-12} µCi/mL, was 0.043 percent of the Derived Concentration Guide (DCG). Refer to Section 4.4 for details pertaining to the change in sampling methods in 1999.

Airborne $^{239+240}$Pu was not detected at the WEF and inside the TRU Storage Building in 1999. All $^{239+240}$Pu results for the perimeter of the RWMS-5 were less than the MDC. Groundwater samples were analyzed for RCRA parameters, gross alpha, gross beta, tritium, and photon emitting radionuclides. No man-made radionuclides or hazardous chemicals were detected in groundwater. Gamma radiation fields were monitored by thermoluminescent dosimeters (TLDs). Neutron radiation fields at the perimeter of the TRU waste storage pad were monitored by proton recoil dosimeters. Radiation exposures above background were measured at RWMS-5, but only at locations where radioactive waste is stored or remained exposed in active disposal units. Infiltration of wetting fronts below the depth of waste disposal units was not detected by soil moisture monitoring.

The results of air monitoring are described further in Chapter 4 and the results of water monitoring are described in Chapter 5.

RWMS-5 PERFORMANCE ASSESSMENT (PA)

The DOE assesses the long-term performance of LLW disposal sites by conducting a PA. A PA is a systematic analysis of the potential risks posed by a waste disposal site to the public and to the environment and a comparison of those risks to established performance objectives. A PA has been completed, reviewed, and approved for the RWMS-5 (Shott et al., 1997a). The PA helps to identify the processes that could cause detectable releases of radioactive materials to the accessible environment during operation of the site. The only release pathway expected at the RWMS-5 in the near term is diffusion of volatile radionuclides through the operational cap to the atmosphere. Tritium is the most abundant volatile radionuclide disposed of at the RWMS-5. PA models indicate that nonvolatile radionuclides may eventually be detected in soil excavated by burrowing animals and in the tissues of deep-rooted vegetation growing on disposal unit covers. Site characterization data and modeling studies indicate that transport of nonvolatile radionuclides from the waste to the uppermost aquifer is extremely unlikely because of the thick dry vadose zone, low precipitation, and high potential evapotranspiration at the site.

RWMS-5 monitoring results are generally consistent with PA results. Tritium, the volatile radionuclide with the largest inventory, is routinely detected in air samples at the RWMS-5 at levels that are a small fraction of the DCGs. Since maintenance operations keep operational covers vegetation free, deep-rooted vegetation samples are not routinely available for analysis. Tritium is the only radionuclide that has been detected in previous analyses of cap vegetation. Groundwater monitoring results confirm that groundwater beneath the RWMS-5 remains uncontaminated. Monitoring of soil moisture content confirms that infiltrating precipitation does not percolate through the disposal unit operational caps because it evaporates and returns to the atmosphere.

RWMS-3 WASTE MANAGEMENT OPERATIONS

The RWMS-3 is used for the disposal of bulk waste. Packaged bulk LLW is accepted from approved onsite and offsite generators.

Unpackaged bulk LLW from NTS environmental restoration projects also has been accepted and disposed of. Disposal is in subsidence craters formed by underground nuclear tests. The subsidence craters range in depth from 15 to 24 m (49 to 78 ft) and are filled by alternating layers of stacked waste packages and 1 m (3 ft) of clean alluvium. Waste disposed of at the RWMS-3 tends to have a lower activity concentration than waste disposed of at the RWMS-5 because bulk waste tends to be generated by environmental restoration projects.

Waste disposal operations at the RWMS-3 began in the U-3ax crater in 1968. The U-3ax crater was eventually joined with U-3bl to form the U-3ax/bl disposal unit. This unit received mostly unpackaged LLW from NTS nuclear testing operations. The U-3ax/bl disposal unit was filled in 1987 and covered with a 2.4-m (8-ft) thick temporary closure cap. This disposal unit is a mixed waste management unit as mixed waste is known to have been disposed of. Waste disposal operations moved to the U-3at crater in 1988 and was joined with the U-3ah crater to form the U-3ah/at disposal unit. This disposal unit remained open in 1999 and contains LLW only. Disposal of unpackaged plutonium contaminated soil, from sites on the NAFR, about 14 mi (22 km) east of Goldfield, Nevada began in the U-3bh crater in 1997. The U-3bh disposal unit remained open in 1999. Radioactivity in air, gamma radiation fields, and soil moisture content were monitored at the RWMS-3 during 1999. Plutonium was the only man-made airborne radionuclide detected at the RWMS-3. The airborne plutonium likely originates from the resuspension of soils contaminated by atmospheric nuclear weapons tests. Gamma radiation fields were monitored by TLDs. Exposure rates greater than background at the RWMS-3 were attributed to surface contamination from past atmospheric nuclear weapons tests. Soil moisture monitoring did not detect the infiltration of wetting fronts below the depth of waste disposal units.

During 1999, the RWMS-3 received 9.07×10^3 m^3 (3.20×10^5 ft^3) of waste containing 9 Ci (0.3 TBq) of activity (see Table 6.8). This represents an increase in volume and a significant decrease in the activity disposed of, compared to the previous year (see Table 6.9). The predominant radionuclides disposed of in 1999 were ^{238}U (44 percent) and ^{234}U (43 percent). The remainder of the activity was predominately ^{90}Sr, ^{137}Cs, ^{3}H, ^{235}U, and ^{230}Th.

RWMS-3 PERFORMANCE ASSESSMENT (PA)

A PA has been conducted for the RWMS-3 (Shott et al., 1997b). Release pathways at the RWMS-3 are expected to be the same as at the RWMS-5 because of the similar site conditions and disposal operations. However, the inventory of radioactive materials disposed of at the RMWS-3 is much less than that disposed of at the RWMS-5. The RWMS-3 inventory of ^{3}H, which is the most likely radionuclide to be released, is significantly less than at the RWMS-5, so the potential for detecting releases of radioactivity is also significantly less. Moreover, the interpretation of environmental monitoring results at the RWMS-3 is confounded by the presence of significant soil contamination from atmospheric nuclear tests. Airborne tritium monitoring at the RWMS-3 was discontinued in 1997 because all results were less than the minimum detectable concentration (MDC). Interpretation of environmental monitoring data from the RWMS-3 and comparison of environmental monitoring results with PA results is difficult because of the small RWMS-3 radionuclide inventory and the presence of contamination from nuclear testing.

HAZARDOUS WASTES

NTS OPERATIONS

Hazardous wastes generated on the NTS are accumulated at a location east of the RWMS-5, the Hazardous Waste

Accumulation Site, before shipment to an offsite treatment, storage, and disposal facility. Hazardous waste generation activities at the NTS are performed under EPA Identification (ID) Number NV3890090001. The NTS continues to be regulated by the 1995 NTS RCRA Hazardous Waste Operating Permit Number NEV HW009 for the general operation of the facility and the specific operation of the Hazardous Waste Storage Unit (HWSU) and the Explosive Ordnance Disposal Unit.

Three permit modifications have occurred since October 1, 1996. These modification include changes in the NTS training program and personnel changes in the Area 5 and Area 11 Emergency Management Plans. The Pit 3 Mixed Waste Disposal Unit located in the RWMS-5 continues to operate under RCRA Interim Status.

The NTS also has a Nevada Hazardous Materials Storage Permit Number 13-94-0034-X, issued by the state Fire Marshall. This permit is renewed annually when a report required by the state's Chemical Catastrophe Prevention Act is submitted.

NON-NTS OPERATIONS

Four EPA Generator ID numbers have been issued to five non-NTS operations. In addition, three local ID numbers were required at one operation. Hazardous waste is managed at all locations, by using satellite accumulation areas. Three operations have centralized accumulation areas. All hazardous and industrial wastes are transported offsite to RCRA-permitted facilities for approved treatment and/or disposal.

SOLID WASTE

At the NTS there are three nonhazardous waste landfills that have state of Nevada Operating Permits, i.e., the Area 6 Hydrocarbon Disposal Site, the Area 9 U-10c Solid Waste Disposal Site, and the Area 23 Solid Waste Disposal Site. There are no monitoring requirements for non-hazardous solid waste disposed of at the NTS in the three landfills; however, before the waste is disposed of, it is weighed.

During 1999, there were approximately 13,910 tons of waste disposed of at the NTS, as shown in Table 6.10. The permitting process considers groundwater protection at these locations.

At the Area 23 Class II Municipal and Industrial Solid Waste Disposal Site, a groundwater monitoring well has been installed. This well also serves to satisfy monitoring requirements for the Mercury sewage lagoon system. An initial baseline water sample was collected in August 1997, and compliance monitoring continued in 1998.

6.6 PERMITS FOR NTS OPERATIONS

Federal and state permits have been issued to DOE/NV and to BN (Table 6.11). These permits are required for the conduct of such DOE/NV activities as hazardous and solid waste storage and disposal for certain ecological studies and for operations involving endangered species. All BN non-NTS facilities are located in existing metropolitan areas and are not subject to the Endangered Species Act. Annual reports associated with these permits are filed as stipulated in each permit.

The only RCRA permit in use at the NTS is the Hazardous Waste Management Permit NEV HW009. With this permit, hazardous waste generated at the NTS can be stored at the Area 5 HWSU for up to one year. It is then shipped offsite for treatment and/or disposal. The permit also allows for the thermal treatment (disposal) of explosives at the Area 11 Explosive Ordnance Disposal Unit.

The North Las Vegas Facility (NLVF) has a Waste Generator number of 03990265X that covers generation and a 90-day accumulation of hazardous waste. The waste is shipped offsite for final treatment and/or disposal.

DOE/NV activities on the NTS comply with all terms and conditions of a desert tortoise incidental take authorization issued in a Biological Opinion (File Number 1-5-96-F-33) from the USFWS.

The Nevada Division of Wildlife issued a scientific collection permit, S19301, to BN that allows collection of wildlife samples.

Table 6.1 Number of Horses Observed on the NTS by Age, Class, Gender, and Year, 1995 - 1999

	Number of Individuals Observed									
Age Class	1995		1996		1997		1998		1999	
Foals	1		1		3		8		5	
Yearlings	3		0		0		0		0	
Adults	M	F	M	F	M	F	M	F	M	F
2 Year	0	0	0	1	0	0	0	0	0	0
3 Year	0	0	0	0	0	1	0	0	0	0
> 3 Years	22	29	21	24	19	20	16	21	11	20
Total (excluding foals)	54		46		40		37		31	

Note: (M = male; F = female)

Table 6.2 Raptor Species that Occur and Breed on the NTS

Raptor Species	Common Name
Aquila chrysaetos	Golden eagle
Asio otus	Long-eared owl
Buteo jamaicensis	Red-tailed hawk
Buteo swainsoni	Swainson's hawk
Falco mexicanus	Prairie falcon
Falco sparverius	American kestrel
Speotyto cunicularia	Burrowing owl
Tyto alba	Barn owl

Table 6.3 Seasonal Data from Selected Natural Water Sources on the NTS Collected - 1999

Water Source	Date	Surface Area of Water (m^2)[a]	Surface Flow Rate (L/Min)[b]	Disturbance at Spring
Cane Spring	10/22	10	2.7	None
Cane Spring	01/20	125	3	Soil cave-in into cave pool
Cane Spring	04/15	56	2.3	None
Captain Jack Spring	10/29	18	2.4	grazing/trampled vegetation
Captain Jack Spring	02/09	15	2.1	grazing/trampled vegetation

Table 6.3 (Seasonal Data from Selected Natural Water Sources on the NTS Collected - 1999, cont.)

Water Source	Date	Surface Area of Water (m^2)[a]	Surface Flow Rate (L/Min)[b]	Disturbance at Spring
Coyote Spring	04/14	1	0	None
Cottonwood Spring	05/12	2	0	None
Gold Meadows Spring	10/20	200	NM[c]	grazing/trampled vegetation
Gold Meadows Spring	01/21	100	NM	grazing/trampled vegetation
Gold Meadows Spring	07/26	0	NM	grazing/trampled vegetation
Little Wildhorse Seep	04/21	0	0	grazing/trampled vegetation
Little Wildhorse Seep	05/05	2	NM	grazing/trampled vegetation
Pahute Mesa Pond	05/05	2,275	NM	None
Rattlesnake Seep	05/05	3	NM	None
Reitmann Seep	10/29	1.5	0.04	None
Reitmann Seep	01/26	1.5	0.05	None
Tippipah Spring	10/08	295	6	None
Tippipah Spring	01/13	260	5.4	None
Tippipah Spring	04/05	380	3.6	None
Topopah Spring	10/22	28	0.8	None
Topopah Spring	02/04	36	0.7	None
Topopah Spring	05/03	69	0.28	None
Wahmonie Seep No. 1	04/01	30	3.6	None
Wahmonie Seep No. 2	04/01	4	NM	None
Wahmonie Seep No. 3	04/01	0	0	None
Wahmonie Seep No. 4	04/01	35	NM	None
Whiterock Spring	10/20	6	2.8	None
Whiterock Spring	01/14	175	1.9	None
Wildhorse Seep	04/21	0	0	grazing/trampled vegetation
Wildhorse Seep	05/05	2	NM	grazing/trampled vegetation
Yucca Playa Pond	10/08	0	0	None
Yucca Playa Pond	01/20	23,000	NM	None

(a) m^2 - Square meters.
(b) L/min - Liters per minute.
(c) NM - Not measurable due to diffused flow.

Table 6.4 Pollution Prevention Results, Volume and Toxicity Waste Reduction - 1999

Activity	Accomplishment	Waste and Toxicity Waste Type	Reduction
Recycle/Reuse	Batteries shipped offsite to be recycled.	Hazardous	22.90 Mg[(a)]
Recycle/Reuse	Scrap metal term sale of lead.	Hazardous	4.54 Mg
Recycle/Reuse	Sent spent intact fluorescent light bulbs offsite to be recycled (result of a PPOA).	Hazardous	4.14 Mg
Recycle/Reuse	Approximately 300 gallons of Diesel fuel were removed from an excessed generator and recycled.	Hazardous	1.13 Mg
Recycle/Reuse	Bulk used oil - sent off site to be recycled.	Hazardous	64.34 Mg
Material Exchange	An estimated 850 pounds of copy machine supplies, of which approximately 50 percent contained hazardous materials, were either redistributed for reuse or returned to the vendor for recycling.	Hazardous	0.39 Mg
Material Exchange	An estimated 850 pounds of copy machine supplies, of which approximately 50 percent contained hazardous materials, were either redistributed for reuse or returned to the vendor for recycling.	Hazardous	.39 Mg
Material Exchange	Paint destined for disposal was used to paint the roofs of several portable shelters.	Hazardous	0.17 Mg
Material Exchange	Fifty cans of spray paint, destined for disposal, were returned to Nevada Test Site painters supply to be used for future projects.	Hazardous	0.02 Mg
Recycle/Reuse	20,825 pounds of used oil and used oil and water mixtures from the Project Shoal site were sent off site for recycling.	Hazardous	9.44 Mg
Source Reduction	The printed circuit board laboratory at BN's offsite location, Special Technology Laboratory in California, was decommissioned, thereby eliminating the sodium persulfate/phosphoric acid waste stream of approximately 55 gallons per year	Hazardous	.21 Mg
TOTALS:			176.89 Mg

(a) Mg = megagram = metric ton = 2205 lb.

Table 6.5 Ongoing Recycling Activities - 1999

Activity	Waste Type	Quantity (Mg)[(a)]
Mixed Paper -paper, cardboard, newspaper, and magazines	Solid	312.5
Aluminum Cans	Solid	1.6
Scrap Metals -ferrous, non-ferrous, and light steel	Solid	711.0
Scrap Metal -lead	Hazardous	4.50
Toner Cartridges	Solid	1.5
Batteries	Hazardous	22.9
Fluorescent Light Bulbs	Hazardous	4.1
Tires	Solid	21.8
Wood pallets	Solid	10.2
Shipping Materials -styrofoam, bubble wrap, boxes	Solid	4.2
Diesel Fuel	Hazardous	1.1
Used Oils	Hazardous	73.8
Total		1169.2

(a) Mg = megagram = metric ton = 2205 lb.

Table 6.6 Low-Level Waste Disposed of at the RWMS-5, 1993 - 1999

Calendar Year	Volume of LLW Disposed (m^3)	Activity of LLW Disposed (Ci)
1993	8,104	3.0×10^4
1994	12,300	5.2×10^4
1995	9,171	5.6×10^2
1996	7,212	7.7×10^3
1997	9,360	2.8×10^5
1998	6,388	3.7×10^4
1999	8,846	1.5×10^6

Table 6.7 Inventory of Radionuclides (>1 mCi) Disposed of at the RWMS-5 in 1999

Radionuclide	Activity (Ci)	Percent of Total Activity
^{227}Ac	9.8×10^{-3}	6.7×10^{-7}
^{241}Am	9.8×10^{-2}	6.7×10^{-6}
^{195}Au	4.8×10^{-6}	3.3×10^{-10}
^{133}Ba	1.7×10^{-2}	1.2×10^{-6}
^{207}Bi	1.5×10^{-6}	1.0×10^{-10}
^{14}C	7.1×10^{-4}	4.9×10^{-8}
^{109}Cd	5.1×10^{-2}	3.5×10^{-6}
^{139}Ce	2.3×10^{-5}	1.6×10^{-9}
^{252}Cf	1.9×10^{-3}	1.3×10^{-7}
^{244}Cm	1.1×10^{-5}	7.6×10^{-10}
^{57}Co	1.1×10^{-3}	7.9×10^{-8}
^{60}Co	7.9×10^{-2}	5.4×10^{-6}
^{51}Cr	1.0×10^{-5}	7.2×10^{-10}
^{137}Cs	1.2×10^{-1}	8.3×10^{-6}
^{134}Ba	4.3×10^{-4}	2.9×10^{-8}
^{152}Eu	8.3×10^{-5}	5.7×10^{-9}
^{154}Eu	3.7×10^{-6}	2.5×10^{-10}
^{55}Fe	2.4×10^{-4}	1.7×10^{-8}
^{203}Hg	6.2×10^{-6}	4.3×10^{-10}
^{131}I	1.1×10^{-4}	7.7×10^{-9}
^{40}K	4.5×10^{-3}	3.1×10^{-7}
^{3}H	1.5×10^{6}	1.0×10^{2}
^{54}Mn	1.3×10^{-3}	8.9×10^{-8}
^{22}Na	1.9×10^{-3}	1.3×10^{-7}
^{63}Ni	5.0×10^{-3}	3.5×10^{-7}
^{231}Pa	1.2×10^{-3}	8.5×10^{-8}
^{210}Pb	8.5×10^{-4}	5.9×10^{-8}
^{147}Pm	8.0×10^{-5}	5.5×10^{-9}
^{210}Po	5.0×10^{-4}	3.4×10^{-8}
^{238}Pu	2.6×10^{0}	1.8×10^{-4}
^{239}Pu	5.3×10^{-1}	3.7×10^{-5}
^{240}Pu	1.2×10^{-1}	8.2×10^{-6}
^{241}Pu	8.8×10^{-1}	6.1×10^{-5}
^{242}Pu	1.1×10^{-5}	7.5×10^{-10}
^{226}Ra	4.3×10^{-3}	3.0×10^{-7}
^{113}Sn	3.7×10^{-6}	2.5×10^{-10}
^{85}Sr	8.3×10^{-5}	5.7×10^{-9}
^{90}Sr	5.9×10^{-1}	4.0×10^{-5}
^{99}Tc	6.7×10^{-6}	4.6×10^{-10}
^{228}Th	1.1×10^{-3}	7.4×10^{-8}
^{229}Th	2.1×10^{-4}	1.5×10^{-8}
^{230}Th	1.7×10^{-2}	1.1×10^{-6}
^{232}Th	4.8×10^{-2}	3.3×10^{-6}
^{204}Tl	4.3×10^{-5}	3.0×10^{-9}
^{232}U	3.1×10^{-4}	2.1×10^{-8}
^{233}U	6.0×10^{-2}	4.1×10^{-6}
^{234}U	1.3×10^{1}	9.0×10^{-4}
^{235}U	1.1×10^{0}	7.7×10^{-5}
^{236}U	5.9×10^{-3}	4.0×10^{-7}
^{238}U	9.3×10^{1}	6.4×10^{-3}
^{88}Y	2.2×10^{-5}	1.5×10^{-9}
Total	1.5×10^{6}	1.0×10^{2}

Table 6.8 Low-Level Waste Disposed of at the RWMS-3, 1993 - 1999

Calendar Year	Volume of LLW Disposed of (m^3)	Activity of LLW Disposed of (Ci)
1993	10,070	2.4×10^{-1}
1994	10,550	2.1×10^{-1}
1995	11,070	3.1×10^{0}
1996	7,109	7.7×10^{0}
1997	15,990	1.4×10^{1}
1998	3,330	2.3×10^{2}
1999	9,175	9.0×10^{0}

Table 6.9 Inventory of Radionuclides (>0.1 Ci) Disposed of at the RWMS-3 in 1999

Radionuclide	Activity (Ci)	Percent of Total Activity
^{3}H	2.6×10^{-1}	2.9×10^{-2}
^{137}Cs	2.5×10^{-1}	2.7×10^{-2}
^{90}Sr	1.5×10^{-1}	1.6×10^{-2}
^{238}U	3.9×10^{0}	4.3×10^{-1}
^{234}U	3.9×10^{0}	4.3×10^{-1}
^{230}Th	1.1×10^{-1}	1.2×10^{-2}
^{235}U	1.8×10^{-1}	2.0×10^{-2}
Total	8.75×10^{0}	9.64×10^{-1}

Table 6.10 Quantity of Wastes Disposed of in Solid Landfills - 1999

	Quantity (in tons)		
Month	Area 9	Area 23	Area 6
January - March	1060	300	25
April - June	2890	342	45
July - September	2230	674	3
October - December	991	2970	2370
Totals	7,170	4,290	2,450

Table 6.11 Permits Required for NTS Operations - 1999

EPA Generator ID

NV3890090001 NTS Activities

NTS Permits

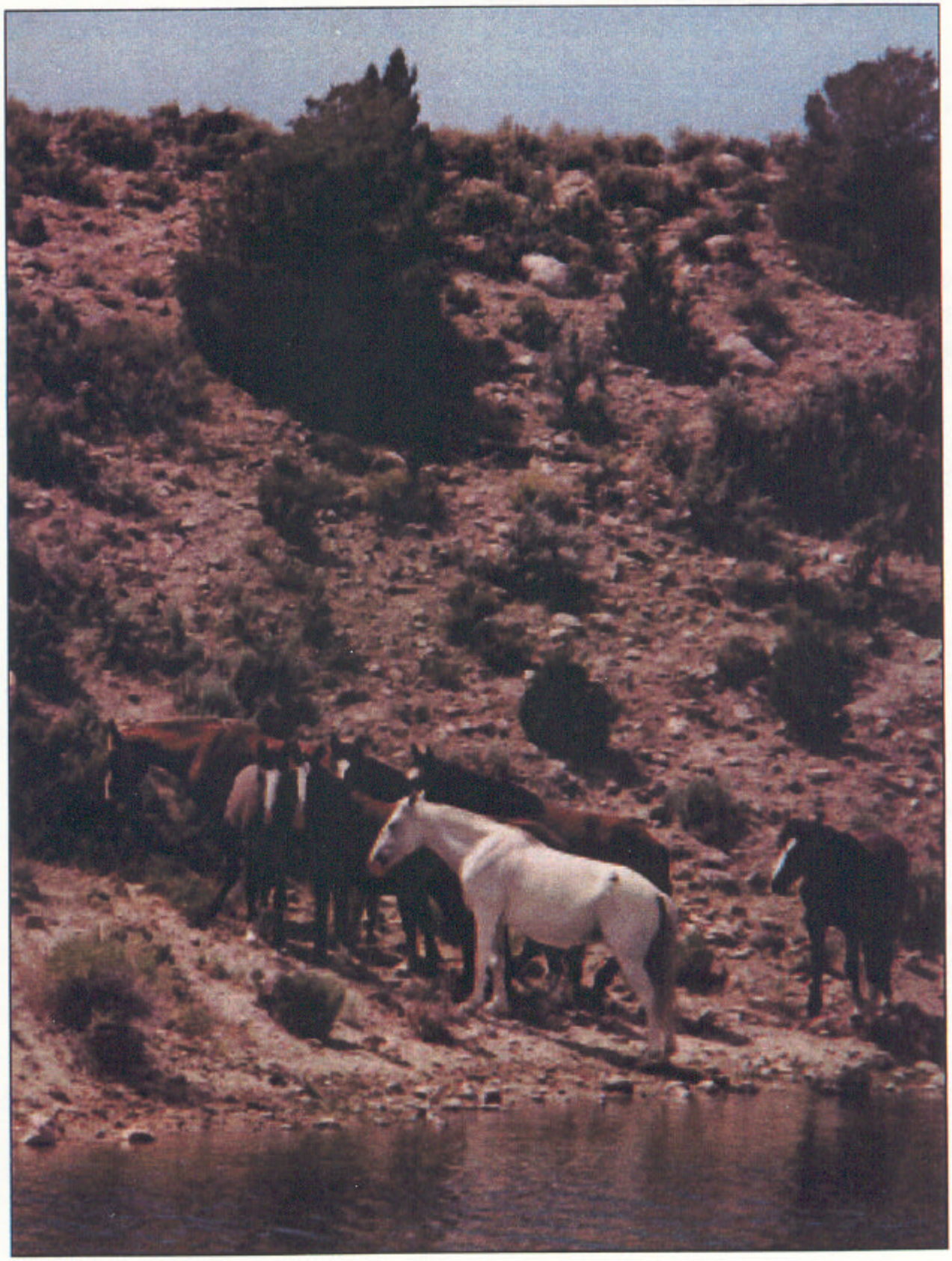
Permit No.	Areas	Expiration Date
NEV HW009	NTS Hazardous Waste Management (RCRA)	05/01/2000
SW 13 097 02	Area 6 Hydrocarbon Disposal Site	Post Closure
SW 13 097 03	Area 9 U-10c Solid Waste Disposal Site	Post Closure
SW 13 097 04	Area 23 Solid Waste Disposal Site	Post Closure
13-99-0034-X	NTS Hazardous Materials	02/29/2000
13-99-0037-X	HSC Hazardous Materials	02/29/2000
S19301	Scientific Collection of Wildlife Samples	12/31/2000
MB008795-0	USFWS -- Desert Tortoise Incidental Take Authorization	12/31/2000

Off-NTS Permits

03-99-0265-X	North Las Vegas Facility Hazardous Materials	02/29/2000
03-99-0266-X	Remote Sensing Laboratory Hazardous Materials	02/29/2000

EPA Generator ID Numbers

NVD097868731	North Las Vegas Facility Activities, NV
CAL00177640	Santa Barbara Operations, CA
CAL00177642	Santa Barbara Operations, CA
CAL00197065	Livermore Operations, CA
NMD986670370	Los Alamos Operations, NM



Wild Horses on the NTS (No date Provided)